# Miniature, Variable-Speed Control Moment Gyroscope, Phase I

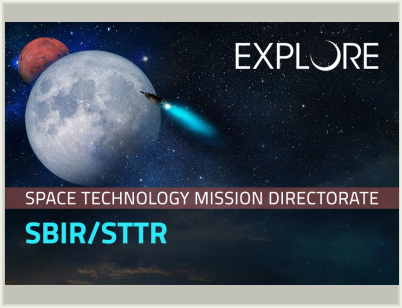
Completed Technology Project (2009 - 2009)

## Project Introduction

The overall goal of this project is to design, develop, demonstrate, and deliver a miniature, variable speed control moment gyroscope (MVS CMG) for use on small satellites. Creare's MVS CMG has the potential to revolutionize the design and operation of small satellites (i.e., mass from less than 1 kg up to 500 kg). Currently available CMGs are too large and heavy, and miniature CMGs do not provide sufficient control authority for use on small satellites. This primarily results from the need to greatly increase the speed of rotation of the flywheel in order to reduce the flywheel size and mass. We will achieve this goal by making use of our unique, proprietary, space-qualified, high-speed (>100,000 RPM) motor technology to spin the flywheel at a speed 10 times faster than the only other known miniature CMG under development with comparable control authority. This will enable the fabrication of an MVS CMG with greatly improved performance and smaller size. Creare is particularly well qualified to lead this effort given our considerable and unique past experience in miniaturizing devices for use in important space missions, our firm's longevity, and the space-qualified fabrication facilities that we maintain.

## Anticipated Benefits

Potential NASA Commercial Applications: Past technical advances in small satellites have opened up new markets for small satellites beyond their initial technology demonstration platforms. These markets include: military science and technology; intelligence, surveillance, and reconnaissance; remote site communications; polling of unattended sensors; high-resolution Earth observations; and Landsat-class environmental monitoring and are estimated to potentially result in a $500 million annual market. Our miniature variable speed control moment gyroscope will enable higher performance for many of these future applications.

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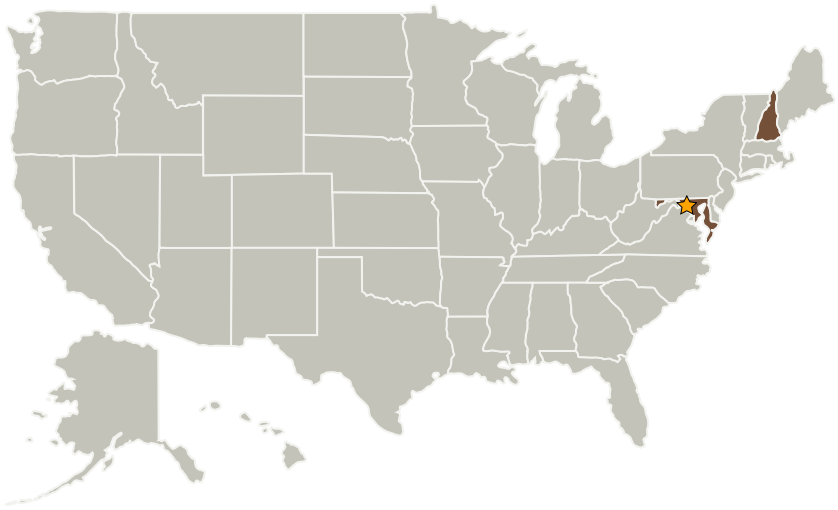
## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Goddard Space Flight Center(GSFC) | Lead Organization | NASA Center | Greenbelt, Maryland |
| Creare LLC | Supporting Organization | Industry | Hanover, New Hampshire |

| Primary U.S. Work Locations | |
|---|---|
| Maryland | New Hampshire |

## Project Transitions

**January 2009:** Project Start

**July 2009:** Closed out

**Closeout Summary:** Miniature, Variable-Speed Control Moment Gyroscope, Phase I Project Image

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

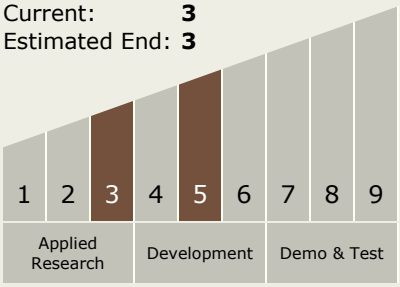
Carlos Torrez

**Principal Investigator:**

Robert J Kline-schoder

## Technology Maturity (TRL)

Start: **5**
Current: **3**
Estimated End: **3**



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## Technology Areas

**Primary:**

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.4 Attitude Estimation Technologies
    - TX17.4.3 Attitude Estimation Sensors